CSTAR Program: Collaborative Science, Technology, and Applied Research

Christopher Hedge
NWS-STI
CSTAR Program Manager

6th NOAA Testbeds and Proving Grounds Workshop, April 14-16, 2015

Content

1. Background
2. Status of ongoing Awards and Budget
3. Examples of CSTAR research to operations
4. New R2O Initiative Projects
5. FY15 call for CSTAR projects

Background

Program for NWS/university collaborative research consisting of:

- Fully competitive, applied research grant program started in 2000
- 1 to 3 year studies--maximum funding level $125K per year
- Objective: To improve NWS forecast and warning services by exploiting S&T improvements to the fullest
- Applied research and education projects involving collaboration between NWS forecasters and university experts
- Proposals must address national, regional or NCEP-related science needs/priorities
- Priority given to proposals that have the potential to be expanded nationally through the Operational Proving Ground

CSTAR Benefits

Forecast and Warning Improvement – high-impact events

- Accelerated transition of research to operations through NWS WFO's/RFC's…NCEP…NWS Testbeds and OPG

Leveraging Resources

- Value of engaging world-class researchers, professors, graduate students at academic institutions far exceeds cost
- Excellent student recruiting tool for university recipients
- Dozens of CSTAR "alumni" have been subsequently employed by NOAA

Ongoing CSTAR Award Status

6 Projects awarded from FY13 FFO

- University of Oklahoma – PI Ming Xie (+3 others)
- SUNY Stony Brook – PI's Colle and Chang
- University of Utah – PI's Steenburgh and Horel
- SUNY Albany – PI's Torn and Bosart
- Florida St University – PI's Fuelberg and Hart
- University of Washington – PI's Mass and Hakim

Ongoing CSTAR Awards

6 Projects awarded from FY14 FFO

- Penn State University – PI's Mejia and Duffy
- NC State University – PI's Parker, Lackmann, and Xie
- Florida Inst. of Tech. – PI's Lazarus and Weaver
- Penn State University – PI's Markowski and Richardson
- Iowa State University – PI's Gallus and Franz
- Texas Tech University – PI's Ancell and Weiss

CSTAR Outreach and R2O Examples

- Webinars with NWS Forecasters: NC STATE
- Training Modules: SUNY Albany
- Publications: University of Washington
- Research cited in AFD's: SUNY StonyBrook Ensemble Sensitivity
- Encourage use of NWS V-Lab

R2O Initiative

- New program aims to accelerate research into operations
- Focus on demonstrating modeling research, forecast tools, and improved software
- To support 23 projects; begin May 2015
- 14 are specific to modeling research/development
- 9 focus on NOAA testbed-related activities
- Total funding: approx. $4.2M/year
- Each proposal: $250K/year up to 2 years.

Testbed-Related R2O Projects

"Validation of Significant Weather Features and Processes in Operational Models Using a Cyclone Relative Approach"

- SUNY SB – PI's Colle and Chang
- 1 May 2015 – 30 April 2017
- Will work with DTC to modify the Model Evaluation Tools (MET) verification software to interface with the extratropical cyclone tracker code and output at EMC.
- Also work with the HMT and OPC to utilize the code in testbeds and experiments.

Testbed-Related R2O Projects

"Test and Evaluation of Rapid Post-Processing and Information Extraction From Large Convection Allowing Ensembles Applied to 0-3hr Tornado Outlooks"

- University of Oklahoma – CIMMS ; collaboration with HWT
- PI's: Correia, LaDue, Karstens, Wheatley, Knopfmeier
- 1 May 2015 – 30 April 2017
- utilize an ensemble-based, radar data assimilation system within the HWT to generate hourly and three hourly tornado outlooks.
- first step in achieving full use of rapidly updating, large convection-allowing ensemble systems and making them useful and usable to forecasters while producing consistent and reliable risk analyses in between the warning and watch time scales.

Testbed-Related R2O Projects

"**Data Mining of High-Resolution Storm-Scale Datasets**"

- University of Oklahoma – CIMMS
- PI's: Smith, ?, Karstens, Ortega with NSSL and HWT
- 1 May 2015 – 30 April 2017
- perform pattern recognition and data mining on the Multi-Year Reanalysis of Remotely Sensed Storms (MYRORSS) dataset (radar)
- identify and track storm clusters at multiple horizontal length scales, ranging from individual convective cells to MCS
- Storm classification technique will be employed to create distributions of storm type and lifetime based on environment

Testbed-Related R2O Projects

"An Investigation of the Skill of Week Two Extreme Temperature and Precipitation Forecasts"

- SUNY Albany in collaboration with HMT
- PI's: Bosart and Keyser
- 1 May 2015 – 30 April 2017
- Improving temperature and precipitation forecasts in the 8-10 day time range at WPC
- Develop methodology for identifying extreme temperature and precipitation events over the CONUS for all seasons
- perform an evaluation of operational NCEP GFS 8-10 day forecast skill for the extreme events
- Add more to notes

Testbed-Related R2O Projects

"Exploitation of Ensemble Prediction System Information in support of Atlantic Tropical Cyclogenesis Prediction"

- SUNY Albany with University of Miami - CIMAS
- PI's: Thorncroft and Dunion collaboration with JHT
- 1 May 2015 – 30 April 2017
- To ensure that recent and current research concerned with the variability of AEW structures and downstream tropical cyclogenesis probability is transferred into operational decision-making at NHC.
- To develop and evaluate tools that exploit key information in dynamical ensemble prediction systems in support of tropical cyclogenesis prediction.

Testbed-Related R2O Projects

"Incorporation of Near Real-Time Suomi NPP Green Vegetation Fraction and Land Surface Temperature Data into the NCEP Land Modeling Suite"

- NESDIS and EMC with JCSDA
- 1 May 2015 – 30 April 2017
- PI's: Csiszar, Vargas, Yu, Ek, Wu, and Zheng
- Improve the use of two operational land surface data products derived from the Visible Infrared Imaging Radiometer Suite (VIIRS) on the Suomi National Polar-orbiting Partnership (SNPP) Satellite.

Testbed-Related R2O Projects

"Application of a Hybrid Dynamical-Statistical Model for Week 3 to 4 Forecast of Atlantic/Pacific Tropical Storm and Hurricane Activities"

- CPC – Climate Testbed
- PI's: Schemm and Wang
- 1 May 2015 – 30 April 2017
- explore the impact of the MJO cycle on sub-monthly tropical storm and hurricane activities in the Atlantic and North Pacific basins
- develop a dynamical–statistical model for week 3 and week 4 forecasts of Atlantic and North Pacific basin tropical storm activity
- implement this model for operational forecasts for the entire hurricane season with updates on a weekly basis

Testbed-Related R2O Projects

"Information Extraction and Verification of Numerical Weather Prediction for Severe Weather Forecasting"

- University of Oklahoma – CIMMS collaboration with HWT EMC and NSSL
- 1 May 2015 – 30 April 2017
- PI's: Jirak, Melick, Brooks, and Pyle
- Refine HWT verification techniques and methods to establish standard scale-appropriate metrics for evaluating NWP forecasts relevant to severe convective weather
- Techniques for extracting hazard-specific information from the models will be developed to provide relevant guidance for SPC and NWS severe weather products and services.

Testbed-Related R2O Projects

"Improvement of Convective/Severe Weather Prediction through an Integrative Analysis of WRF Simulations and NEXRAD/GOES Observations over the CONUS"

- University of North Dakota
- PI's: Dong, Kennedy, and Gilmore; collaboration with HWT and CIMMS
- 1 May 2015 – 30 April 2017
- Will perform detailed evaluations of both deterministic and ensemble suites of convection-permitting simulations
- existing HWT simulations from NSSL and NCEP will be evaluated via objective verification software utilizing NEXRAD reflectivity and Q2/Q3 precipitation products provided by the NSSL.
- development of an ensemble forecasting system for WRF where the current WRF default (WSM6) and numerous other microphysical schemes will be evaluated.

Next CSTAR Request for Proposals

- Issued during the summer 2 of every 3 years
- Should be in grants.gov in July-August 2015
- Expect approximately 4-6 new projects to be funded
- Request to raise annual funding limit
- Incorporate latest priorities from NWS Regions and NCEP
- Data sharing is now required
- Expect PI's to begin using the NWS VLab CSTAR Community to share research and development work and results

Contact Information

Christopher Hedge

NWS-STI CSTAR Program Manager
1325 East-West Highway Room 15328
Silver Spring MD
301-427-9242

CSTAR Awards Page:
http://www.nws.noaa.gov/ost/cstar.htm